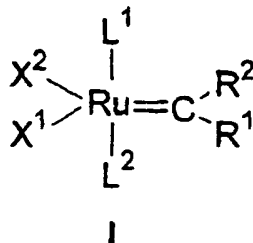


## Claims:

1. A complex of ruthenium of the structural formula I,



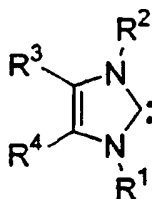
5

where  $X^1$  and  $X^2$  are identical or different and are each an anionic ligand,

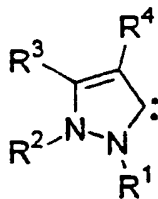
$R^1$  and  $R^2$  are identical or different and can also  
 10 contain a ring, and  $R^1$  and  $R^2$  are each hydrogen or/and a hydrocarbon group, where the hydrocarbon groups are identical or different and are selected independently from among straight-chain, branched, cyclic or/and noncyclic radicals from the group consisting of alkyl  
 15 radicals having from 1 to 50 carbon atoms, alkenyl radicals having from 1 to 50 carbon atoms, alkynyl radicals having from 1 to 50 carbon atoms, aryl radicals having from 1 to 30 carbon atoms and silyl radicals,

20 where one or more of the hydrogen atoms in the hydrocarbon or/and silyl groups can be replaced independently by identical or different alkyl, aryl, alkenyl, alkynyl, metallocenyl, halogen, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido,  
 25 carboxyl, carbonyl, thio or/and sulfonyl groups,

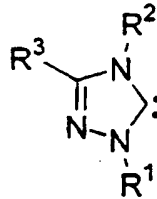
the ligand  $L^1$  is an N-heterocyclic carbene of the formulae II-V and the ligand  $L^2$  is an uncharged electron donor, in particular an N-heterocyclic carbene of the formulae II-V or an amine, imine, phosphine,  
 30 phosphite, stibine, arsine, carbonyl compound, carboxyl compound, nitrile, alcohol, ether, thiol or thioether,



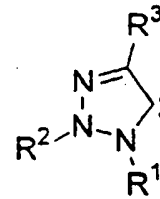
II



III



IV



V

where  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  in the formulae II, III, IV and V are identical or different and are each hydrogen or/and a hydrocarbon group,

where the hydrocarbon groups comprise identical or different, cyclic, noncyclic, straight-chain or/and branched radicals selected from the group consisting of alkyl radicals having from 1 to 50 carbon atoms, alkenyl radicals having from 1 to 50 carbon atoms, alkynyl radicals having from 1 to 50 carbon atoms and aryl radicals having from 1 to 30 carbon atoms, in which at least one hydrogen may be replaced by functional groups, and where one or both of  $R^3$  and  $R^4$  may be identical or different halogen, nitro, nitroso, alkoxy, aryloxy, amido, carboxyl, carbonyl, thio or/and sulfonyl groups.

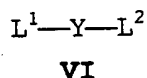
2. A complex as claimed in claim 1, wherein the identical or different anionic ligands  $X^1$  and  $X^2$  are each halide, pseudohalide, tetraphenylborate, perhalogenated tetraphenylborate, tetrahaloborate, hexahalophosphate, hexahaloantimonate, trihalomethanesulfonate, alkoxide, carboxylate, tetrahaloaluminate, tetracarbonylcobaltate, hexahaloferate(III), tetrahaloferate(III) or/and tetrahalopalladate(II), with preference being given to halide, pseudohalide, tetraphenylborate, perfluorinated tetraphenylborate, tetrafluoroborate, hexafluorophosphate, hexafluoroantimonate, trifluoromethanesulfonate, alkoxide, carboxylate, tetrachloroaluminate, tetracarbonylcobaltate, hexafluoroferrate (III),

tetrachloroferrate(III) or\and tetrachloropalladate(II) and preferred pseudohalides being cyanide, thiocyanate, cyanate, isocyanate and isothiocyanate.

5 3. A complex as claimed in claim 1 or 2, wherein some or all of the hydrogen atoms in the hydrocarbon groups  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  in the formulae II, III, IV and V are replaced independently by identical or different  
10 halogen, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio, sulfonyl or/and metallocenyl groups.

4. A complex as claimed in any one of claims 1 to 3, wherein  $R^3$  and  $R^4$  in the formulae II, III, IV and V form  
15 a fused-on ring system.

5. A complex as claimed in any one of claims 1 to 4, where in  $L^1$  and  $L^2$  form a chelating ligand of the formula VI  
20



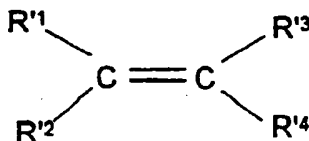
where the bridges Y can comprise cyclic, noncyclic,  
25 straight-chain or/and branched radicals selected from the group consisting of alkylene radicals having from 1 to 50 carbon atoms, alkenylene radicals having from 1 to 50 carbon atoms, alkynylene radicals having from 1 to 50 carbon atoms, arylene radicals having from 1 to  
30 30 carbon atoms, metallocenylene, borylene and silylene radicals in which one or more hydrogens may be replaced independently by identical or different alkyl, aryl, alkenyl, alkynyl, metallocenyl, halo, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl,  
35 carbonyl, thio or/and sulfonyl groups, preferably alkyl, aryl or/and metallocenyl groups.

6. A complex as claimed in any one of claims 1 to 5, wherein the ligands of the formulae II, III, IV, V or/and VI have central, axial or/and planar chirality.

- 5 7. A complex as claimed in any one of claims 1 to 6, wherein  $R^1$  and  $R^2$  in the structural formula I are hydrogen, substituted or/and unsubstituted alkyl, alkenyl or/and aryl radicals,  $X^1$  and  $X^2$  are halide, alkoxide or/and carboxylate ions or/and  $L^1$  and  $L^2$  are  
10 each an N-heterocyclic carbene of the formula II.

8. A process for preparing acyclic olefins having two or more carbon atoms or/and cyclic olefins having four or more carbon atoms, in each case of the formula VII

15



VII

- from acyclic olefins having two or more carbon atoms or/and from cyclic olefins having four or more carbon  
20 atoms, in each case corresponding to the formula VII by an olefin metathesis reaction in the presence of at least one catalyst, wherein a catalyst as claimed in any one of claims 1 to 7 is used and  $R'^1$ ,  $R'^2$ ,  $R'^3$  and  $R'^4$  in the formula VII are hydrogen or/and hydrocarbon  
25 groups,  
where the hydrocarbon groups are each selected independently from among straight-chain, branched, cyclic or/and noncyclic radicals of the group consisting of alkyl radicals having from 1 to 50 carbon  
30 atoms, alkenyl radicals having from 1 to 50 carbon atoms, alkynyl radicals having from 1 to 50 carbon atoms, aryl radicals having from 1 to 30 carbon atoms, metallocenyl or/and silyl radicals, in which one or more hydrogens may be replaced by a functional group,

where one or more of R'<sup>1</sup>, R'<sup>2</sup>, R'<sup>3</sup> and R'<sup>4</sup> may independently be identical or different halogen, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio, sulfonyl or/and metallocenyl groups.

9. The process as claimed in claim 8, wherein one or more double bonds are present in the olefins used.
10. The process as claimed in claim 8 or 9, wherein R'<sup>1</sup>, R'<sup>2</sup>, R'<sup>3</sup> and R'<sup>4</sup> in the olefins of the formula VII to be prepared form, in pairs, one or more identical or different rings.
11. The process as claimed in any one of claims 8 to 10, wherein some or all of the hydrogen atoms in the hydrocarbon groups R'<sup>1</sup>, R'<sup>2</sup>, R'<sup>3</sup> and R'<sup>4</sup> of the olefins of the formula VII to be prepared are replaced independently by identical or different halogen, silyl, nitro, nitroso, hydroxy, alkoxy, aryloxy, amino, amido, carboxyl, carbonyl, thio, sulfonyl or/and metallocenyl groups.
12. The process as claimed in any one of claims 8 to 11, wherein the process is carried out in the presence or absence of solvents, but preferably in the presence of organic solvents.
13. The process as claimed in any one of claims 8 to 12, wherein the process is carried out with addition of a Brönsted acid, preferably HCl, HBr, HI, HBF<sub>4</sub>, HPF<sub>6</sub> or/and trifluoroacetic acid.
14. The process as claimed in any one of claims 8 to 12, wherein the process is carried out with addition of a Lewis acid, preferably BF<sub>3</sub>, AlCl<sub>3</sub> or/and ZnI<sub>2</sub>.